an inability of the liver to synthesize the maturation factor.

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REFERENCES

1. Cheney, G.: California & West. Med., 39:90 (Aug.), 1933.
2. Van Duyn, J., Jr.: Arch. Int. Med., 52:839 (Dec.), 1933.
3. Wintrobe, M. M.: Arch. Int. Med., 57:289 (Feb.), 1936.
4. Rosenberg, D.: Am. J. Med. Sc., 192:86 (July), 1936.
5. Schalm, L.: Acta Med. Scandinav., 93:517, 1937.
6. Sturgis, C. C.: J. Iowa State Med. Soc., 28:373, 1938.
7. Wintrobe, M. M.: J. Lab. and Clin. Med., 17:899 (June), 1932.
8. Wintrobe, M. M.: Internat. Clin., 2 (new series): 44 (June), 1939.
9. Castle, W. B., Heath, C. W., and Strauss, M. B.: Am. J. Med. Sc., 182; 741, 1931.
10. Goldhamer, S. M.: Arch. Int. Med., 53:54, 1934.
11. Schiff, L., Rich., M. L., and Simon, S. D.: Am. J. Med. Sc., 196:313, 1938.
12. Groen, J., and Snapper, I.: Am. J. Med. Sc., 193: 633, 1937.
13. Alsted, G.: Am. J. Med. Sc., 197:741 (June), 1939.
14. Wills, L., and Evans, B. D. F.: Lancet, 2:416, 1938.
15. Wills, L., Clutterbuck, P. W., and Evans, B. D. F.: Biochem. J., 31:2136, 1937.
16. Elsom, K. O., and Sample, A. B.: J. Clin. Investigation, 16:463, 1937.
17. Dockeray, G. C.: Irish J. Med. Sc. (March), 1938, p. 126.
18. Atkin, I.: Lancet, 1:434, 1938.
19. Bianco, A., and Jolliffe, N.: Am. J. Med. Sc., 196: 414, 1938.
20. Sydenstricker, V. P., Schmidt, H. L., Geeslin, L. E., and Weaver, J. W.: Am. J. Med. Sc., 197:755, 1939.
21. Wayburn, E. and Guerard, C.: Arch. Int. Med., 66:161 (July), 1940.

FEMORAL HERNIA: A MODIFIED POSITION FOR ITS REPAIR*

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THE femoral vein in the usual operating position encroaches upon the operative field in the repair of femoral hernia. The purpose of this paper is to describe a modified position which displaces the femoral vein laterally, and thereby facilitates the procedure.

Femoral hernia occurs much less frequently than does inguinal hernia. Reported series of comparative statistics vary from 1:17[1] to 1:50.[2] This low incidence may prevent the casual operator from contacting a sufficient number of cases to become familiar with the surgical anatomy of the region, and with the accepted procedures for the repair of the defect. Therefore, a preliminary brief consideration of some of the anatomical and diagnostic problems involved, and of the application of the different surgical approaches to the problem may be in order.

ANATOMICAL PROBLEMS

Anatomically, the structures to be considered may be divided into three groups: (1) the inguinal and lacunar ligaments, which form the roof and medial border of the ring; (2) the ligament of Cooper and the pectineal fascia which form the floor of the ring and the canal; and (3) the process of fascia, which separates the femoral vein from the canal and forms the indefinite lateral boundary of the latter. These are the structures involved in both the reduction and the repair of the hernial defect. It is the approximation of the first to the second, without injury to or constriction of the third, after the ligation, reduction, and transplantation of the sac, that constitutes an accepted operation.

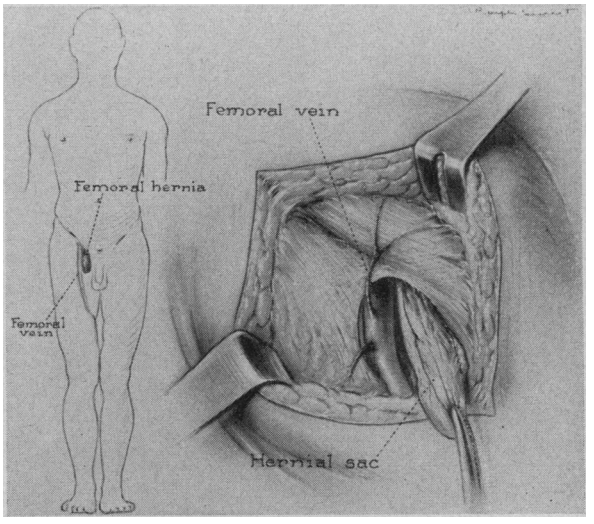

Fig. 1.—Modified position in the repair of femoral hernia. Relationship of femoral vein to sac in usual operating position.

The lacunar ligament is of particular importance, since its sectioning offers a method of enlarging the ring, when this is necessary, without cutting the main fibres of the inguinal ligament. In sectioning of the lacunar ligament there is less likelihood of damage to important structures, and a firmer closure of the ring is obtained. Anatomical studies[3] have shown that in 28 per cent of all individuals an anomalous obturator artery arises from the deep epigastric artery. In 3 per cent of these cases the obturator artery descends to the obturator foramen medial to the femoral ring; in 25 per cent it descends medial to the vein, but lateral to the ring. This means that the lacunar ligament can be sectioned with less chance of vascular injury than can the inguinal ligament. Furthermore, sectioning of the lacunar ligament does not weaken the closure of the femoral ring, as does sectioning of the inguinal ligament. In the first instance repair of the ligament entails only a continuation of the closure medially over the sec-

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tioned portion; in the second instance closure of the defect is complicated by the additional tension incident to repair of the ligament.

Cooper's ligament is of importance because it offers a firm band of transverse fibers at the highest and narrowest point of the ring for the

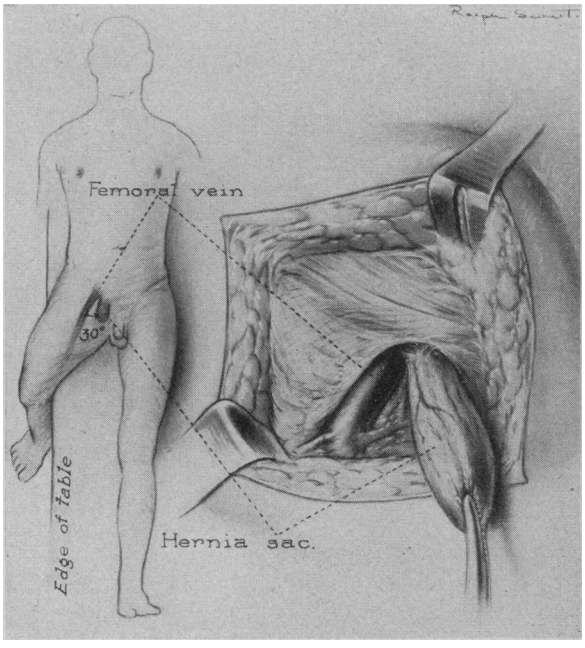

Fig. 2.—Modified position showing sac in same relative position to inguinal ligament as in Fig. 1, but with vein moved laterally.

posterior suture. For this reason it should be included with the pectineal fascia in this suture.

DIAGNOSIS

The diagnosis of femoral hernia is not always easily made. In the first place, a femoral hernia can be mistaken for an incomplete inguinal hernia. After the sac has descended to the bottom of the femoral canal, it often passes forward through the saphenous opening, and may lie over the inguinal ligament in the region of the external ring. In the second place, femoral hernia can be, and often is mistaken for an enlarged gland, and the reverse is true. I have twice seen femoral hernias, which had been mistaken for suppurative glands, needled. This is one region where diagnostic puncture should be avoided. I have seen two fatal cases of gas bacillus infection which resulted from strangulation of a small segment of intestine in a femoral hernia. Both of these hernias had been treated primarily as infected glands. Lastly, I have twice opened the abdomen for release of a partial obstruction, only to find a small strangulation, (Richter's hernia), in the femoral canal which could not be palpated externally because of excessive adiposity. A means of differential diagnosis, which has been helpful to me, is the careful palpation of the inguinal ligament just above the tumor. If a femoral hernia exists, the stalk of the hernia usually can be felt as a longitudinal ridge passing beneath the inguinal ligament.

REDUCTION AND REPAIR

The reduction and repair of femoral hernia, like all surgical procedures, may be easy or difficult of execution. The local condition determines the character of the operation. There are three main approaches for the surgical repair of the condition: (1) through the inguinal canal; (2) through a low rectus or midline incision; and (3) the femoral approach below the inguinal ligament. Each surgeon has his favorite approach, but the rational procedure would seem to be to use the one best adapted to the case under consideration.

The approach through the inguinal canal has many advocates and offers several possible methods of repair: (1) suture of the conjoined tendon to Cooper's ligament (Lotheissen); (2) suture of the inguinal ligament to the pectineal fascia (Moschowitz); (3) suture of the transversalis fascia to Cooper's ligament (Dickson); and (4) the displacement, ligation, and transplantation of the sac through the inguinal incision, and the closure of the femoral canal from below the ligament. The inguinal approach is definitely indicated in cases of coexisting inguinal hernia or weakness, since it offers a single procedure for the repair of both. However, to open an intact inguinal canal, for the repair of an uncomplicated femoral hernia, hardly seems justifiable.

The repair of femoral hernia through a rectus incision, and, in thin patients, through a low midline incision, under adequate anesthesia, is an

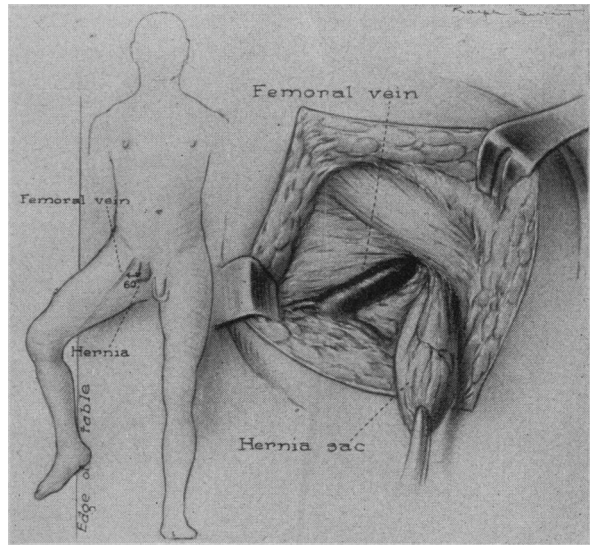

Fig. 3.—Same as Fig. 2 except that vein is moved farther from the sac by external rotation and flexion of the hip.

easy procedure. It is indicated in the course of a laparotomy if the intraabdominal operation has not been extensive, and if there is no reason to suspect active infection incidental to the intra-

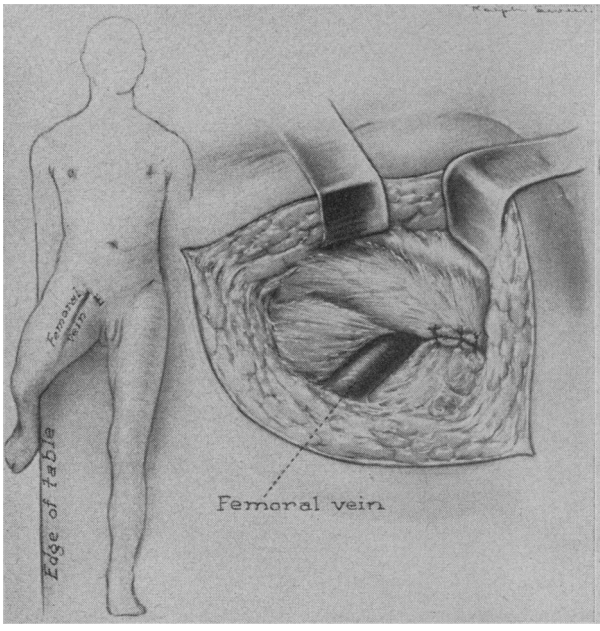

Fig. 4.—Modified position in the repair of femoral hernia. After repair, relationship of vein to lateral suture, with hip in abduction.

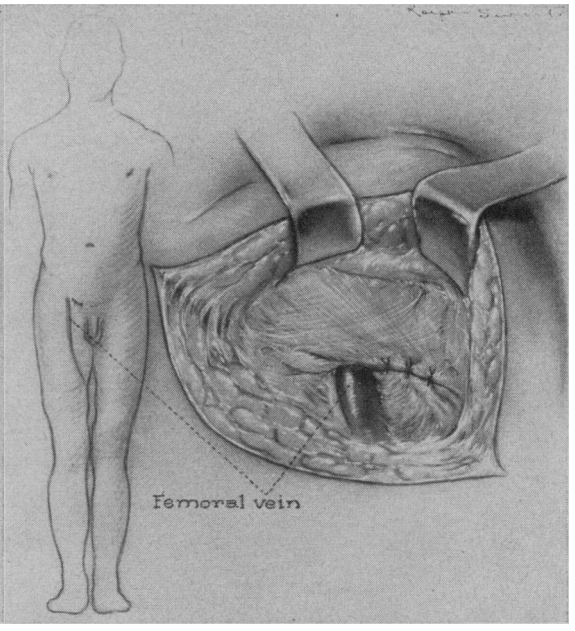

Fig. 5.—Modified position in the repair of femoral hernia. After repair, relationship of vein to lateral suture, with leg in normal position.

abdominal pathology. In this procedure, the upper aspect of the femoral ring is exposed by separating the peritoneum from the inner surface of the rectus and the lateral abdominal muscles; the sac is drawn through the ring, emptied of its contents, ligated at its neck, and resected distal to the ligature; the femoral ring is closed by interrupted sutures from above. This approach was used in each of the two cases of Richter's hernia referred to above, and has also constituted an elective procedure. It is indicated and recommended in the presence of coexistent intraabdominal pathology that can be reached through a low rectus or midline incision. In one of our cases an anomalous obturator artery was present, which was ligated and sectioned before the ring was sutured.

The femoral approach is the most direct, and results in the least damage to other anatomical structures. It also offers a direct and immediate appraisal of the contents of the sac. The most frequent technical difficulty is due to disproportion in the size of the protruding structures and the size of the ring. Sectioning of the lacunar ligament may be necessary. After the reduction of the hernia and the ligation of the sac, the stump should be transplanted high under the inguinal ligament whenever the exposure of the ligament will permit. The femoral approach is indicated in cases of uncomplicated hernia.

The proper treatment of strangulation of the intestine in femoral hernia has been well outlined by Shelley.[4] Resection and anastamosis should not be executed below the ring, because of the difficulty of replacing the mass incidental to anastomosis, through the narrow ring, without injury to the line of suture. In such cases the strangulated intestine should be returned to the abdomen, and the femoral ring and wound closed. Investigation of the strangulated segment should be made through a low rectus incision and the appropriate surgical procedure as determined by the appearance of the gut, carried out.

The one important structure which is subject to damage in repair of the ring is the femoral vein. This lies just lateral to the canal and ring, and at times under the hernial sac. The direction of the vein in this region is downward and 15° inward. Its presence narrows the operative field and because of its proximity to the ring, the most lateral suture in the usual operating position often leaves a large space under the inguinal ligament through which a femoral hernia can recur.

The direction of the vein can be changed from 15°, inward, to 35° and more, outward, by abduction of the hip, which is obtained by allowing the flexed knee to hang over the side of the operating table. Further displacement of the vein can be obtained by flexion and external rotation of the hip, but this position tenses the structures of the ring and of the canal. Either position displaces the vein laterally at the ring, and thus clears the surgical field sufficiently to permit not only safer, but also more lateral placing of the sutures. A more complete closure of the ring is obtained. Simple abduction is the position of choice.

After the sac has been ligated and the sutures have been placed with the hip in abduction, the leg should be brought back on the table parallel with the other leg so that the vein may be under observation during the tying of the sutures. If

the most lateral suture has been placed too far out, so as to constrict the vein, another suture may be placed medial to it before the lateral suture is removed.

In cases of large rings there may be considerable tension on the sutures even with the legs in parallel position. Tension may be further relieved by flexion of the hip, since this position relaxes the pectineal muscle, the superficial origin of which is the under surface of the pectineal fascia, and this is continuous with Cooper's ligament. In this type of case the hip should be maintained in adduction and flexion, by means of pillows under the knees, during the immediate postoperative period.

SUMMARY

1. The anatomy of the femoral region is briefly reviewed, and the indications for the three main surgical approaches for the repair of femoral hernia are discussed.

2. The repair of femoral hernia through a low rectus incision is reported.

3. A modified position, which displaces the femoral vein from the operative field and thereby assists in a more complete closure of the defect, is described.

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REFERENCES

1. Stone, H. B. Hernia. Lewis: Practice of Surgery, VII, chap. 9, p. 28.

2. McClure, R. D., and Fallis, L. S. Femoral hernia; report of 90 operations. Ann. Surg. 109:987-1000 (June), 1939.

3. Gray's Anatomy, ed. 24, Longman's, 1930, p. 718.

4. Shelley, Harold J. Femoral hernias. Arch. Surg. 41:1229-1243 (November), 1940.

POISONING IN CHILDHOOD: CERTAIN SIGNIFICANT ASPECTS OF ITS ETIOLOGY AND TREATMENT*

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INTRODUCTION.—The desire of the authors to undertake a rather comprehensive review of the subject of poisoning in childhood arose from their recognition of the paucity of such studies, and a sincere wish to become better informed.

We began by asking the Coroner's office to show us what were the most common causes of fatal poison accidents, and then, so to speak, worked backwards through the receiving hospitals, and drug and grocery store shelves, finally arriving at the textbooks. The advantage of this approach was twofold. In the first place we were immediately made aware of what was important, because we certified the actual causes of fatal accidents. The second point was that we could eliminate data not pertinent to the problem as encountered in this area.

It is so evident that new contributions to therapy of poisoning have been made in recent years, that all books prior to 1932 were empirically discredited.

Reading about toxic agents that affect children has given us the impression that articles in English are few, and may often fail to withstand close examination. One of the most reasonable was written by Aikman for the Brennemann *Pediatrics,* and is recommended reading on this subject. For the sources of information we direct your attention to concluding paragraphs of the paper.

The main portion of this review is begun by discussion of the major toxic agents responsible for acute poisoning.

MAJOR GROUPS OF TOXIC AGENTS

In attempting to list the major poisons it is at once apparent that they do not group very well. On the other hand, if we merely list them alphabetically, all pharmacological principles are abandoned, and confusion is increased.

The plan followed by McNally in his *Toxicology* is useful, and with numerous omissions it will be given herewith:

The strong acids, alkalis, and oxalic acid are *inorganic* poisons. The ability of muriatic acid and of lye to attack grease, and to open clogged drains rather guarantees that they are also very destructive to living tissue, and are powerfully corrosive.

Iodine, chlorine, permanganate and phosphorus are described as *irritant* poisons, and are capable of corrosive action, too.

The next group, the *heavy metals,* include many potent poisons, some of which are not only dangerous in the pure metallic form, as with mercury, but have highly poisonous salts as well. These substances may act through the blood stream, producing remote injury to special tissue, as mercury on kidney and lead on the central nervous system, but they also produce local corrosive action, as is seen in the stomach after ingestion of arsenic or mercuric chloride.

Gaseous poisons act in several ways; they may suffocate the individual by replacing the oxygen in the environmental atmosphere, as occurs with carbon dioxide, or they may destroy the oxygen carrying power of the blood by replacement of oxygen in the hemoglobin radical, as with carbon monoxide; or they may even act as strong pulmonary irritants, producing pulmonary edema, as follows inhalation of bromine and sulfur dioxide.

Pharmacologically, the *alkaloids* are tremendously important because they are comparatively reliable in site and manner of action; but in this part of the country, they are by no means responsible for the largest mortality in children.

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